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AN INTERESTING MODIFICATION IN XANTHIUM

CHARLES A. SHULL

Two years ago I received through the kindness of Mr. F. F. Crevecoeur, of Onaga, Kansas, some burs of Xanthium which show a very unique and interesting modification. The ordinary burs of Xanthium are too common and familiar to need description. Normally they enclose but two ovaries, and possess only two beaks which arise conjointly from the outer end of the bur. Through these beaks the styles protrude at the time of pollination.

These modified burs, however, enclose a considerable number of ovaries, usually between twenty and thirty. The beaks are correspondingly increased in number, and are arranged in two or three concentric rows about a central depression which occupies the central part of the distal half of the bur. Figure 1 shows the burs about natural size. The form of the bur is probably determined by the cessation of growth by the centripetal portion of the receptacle, while the centrifugal zone continues to develop, and imbeds a number of flowers which are apparently arranged in more or less concentric rows. Figure 2 shows one of the burs with the outer wall of the receptacle removed so as to show the outer row of seeds, each of which is enclosed in its black ovarial wall.

The exact structure of the bur is most easily understood from an examination of the cross section of the bur taken slightly above the equator, just beyond the bottom of the depression previously mentioned. Such a section is shown in Figure 3. Not all of the burs had the same number of ovaries, but the general structure of all was the same. In this particular bur there were twenty-six ovarial cavities in the receptacle, twenty-three of which contained the remains of ovaries. The position of the cavities which contained ovaries are indicated by small circles. The other three cavities contained no trace of ovaries, but their position indicates clearly enough that they correspond to a third row of florets.

There is a very strong tendency to sterility, apparently, for many of the ovaries were empty. Of the twenty-three ovaries found in the bur shown in Figure 3, only twelve contained seeds. And a small box of burs coming from direct descendants but two generations removed from the original plant showed complete sterility, entire absence of seeds.

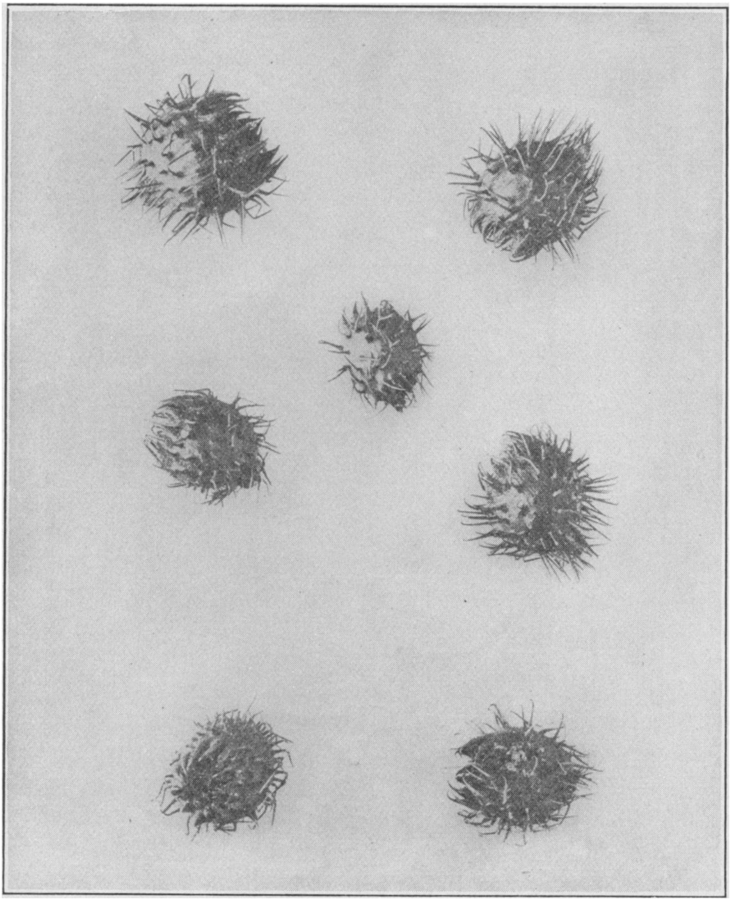

FIG. 1. *Xanthium canadense* var. *globuliforme* Crevecoeur. Burs about natural size.

The history of this interesting race of cockleburs extends through three generations, beginning in 1909, at which time the original parent was discovered growing in a corn field, by a farmer living near Onaga, Kansas. This parent plant was given to Mr. Crevecoeur, who planted some of the burs in his flower garden in the spring of 1910. He secured a number of plants from them, and reports that "a portion of the plants bore the same kind of burs as the well known *X. canadense*, while the major portion bore the same kind as the seed planted." This would seem to fix the relationship of the type to *X. canadense*, and Mr. Crevecoeur labelled the specimen in his herbarium *X. canadense* var. *globuliforme*.

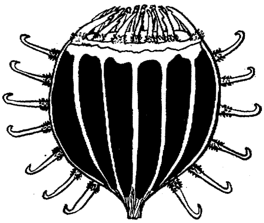

FIG. 2. Bur with wall removed to show seeds.

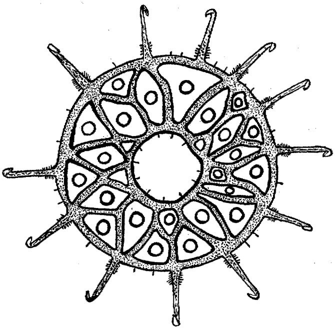

FIG. 3. Diagrammatic cross section of a bur showing arrangement of seeds.

The following year, 1911, seeds of the plants grown in 1910 were sent to Miss Grace Meeker, of Ottawa, Kas., who secured a third generation. All of the plants in this third generation were of the *globuliforme* type, but they produced burs which were small, and devoid of seeds. With these plants the group became extinct.

Mr. Crevecoeur sent me quite a number of burs, and many seeds were planted, but all were non-viable. In some cases patches of cells in the cotyledons were still alive, but not a single hypocotyl showed signs of life. The early loss of viability in this case was partly due, no doubt, to the fact that the plants of the second generation, 1910, were destroyed while the burs were somewhat immature, in order to prevent possible escape from cultivation. It is quite natural that one sholud not desire the survival of a cocklebur producing twenty or more seeds to the bur!

In the spring of 1915 two of the burs still remaining from the original parent were planted at Onaga, but the seeds did not germinate. The possibility of studying the inheritance of the bur characters in crosses and self-fertilized strains is thus precluded so far as this local appearance of the variety is concerned. From two other sources have come vague reports of the same varieties in other localities, but investigation has failed to uncover them. However, it is possible that intelligent observation by field botanists might lead to their rediscovery.

Nothing is known regarding the cause, or manner of origin, of the *globuliforme* type. The character of the modification is such that it could hardly result from hybridization, although splitting was noted in the 1910 generation. The cause of the sterility is merely conjectural and might be due to various factors. Sterility of pollen, if it really occurs, would not necessarily indicate a case of hybridization.

It seems more reasonable to consider it a mutation from *X. canadense* Miller. Whether it is progressive, a new condition, or retrogressing toward remote ancestry, one cannot tell. But in view of Farr's recent studies on the origin of inflorescences and dicliny in Xanthium,[1] the latter possibility is particularly significant. Farr reaches the conclusion that the bur is a reduced capitulum, in which the florets now, of course, are reduced to two. If this *globuliforme* type is a reversional mutation, it gives a concrete idea of the kind of capitulum from which the reduction has occurred. Such a concrete picture is a distinct advantage in any attempt to depict the lines along which such an evolutionary advance has proceeded.

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[1] Farr, Clifford H., The Origin of the Inflorescences of Xanthium. Bot. Gaz. **59**: 136–148. 1915.